XVII. *An Account of ſome* Obſervations *and* Experiments *made in* Sibiria, *extracted from the Preface to the* Flora Sibirica, *ſive* Hiſtoria Plantarum Sibiriæ cum tabulis æri inciſis. *Auct. D.* Gmelin. *Chem & Hiſt. Nat. Prof.* Petropoli 1747. 4*to. Vol.* I. *by* John Fothergill, *M. D. Lic. Colleg. Med. Londin.*

Read Feb. 11. 1747-8. BY Direction of the late Empreſs of *Ruſſia*, ſeveral Members of the *Royal Academy* of *Sciences* at *Petersburg* undertook a Journey into *Sibiria*, in order to inquire into the Natural Hiſtory of that Country, and to make ſuch Experiments and Obſervations, as might tend to give a juſt Idea of that almoſt unknown Region, and to the Improvement of Phyſics in general.

Dr. *John George Gmelin*, Profeſſor of Chemy and Natural Hiſtory at *Petersburg*, was ſent at the Head of this Deputation, who, beſides ſeveral of his Collegues, and ſome Students, had a Painter or two, a Miner, Huntſman, and proper Attendants in his Retinue.

He ſet out upon this Expedition in *Auguſt* 1733. and returned to *Petersburg* in *Feb.* 1742. after having ſpent nine whole Years in viſiting almoſt every Part of *Sibiria*.

The Fruits of this Undertaking are deſigned to be communicated to the Pubilc; and one Volume

of the Hiſtory of Plants has already appeared, under the Title of *Flora Sibirica, ſive Hiſtoria Plantarum Sibiriæ, Tom.* I. *continens Tabulas Æri inciſas L. Auctore D.* Joh. Geo. Gmelin. *Chem. et Hiſt. Natur. Prof.* Petropoli *Typis Academiæ Regiæ Scientiarum* 1747. This is intended to be followed by ſeveral others, containing a not only a Deſcription of the Plants, their *Locus natalis*, &c. but their Uſes amongſt the Inhabitants, ſo far as the Profeſſor could get Information concerning them.

In a large Preface to this firſt Volume, the ingenious and indefatigable Author has given us a conciſe Account of *Sibiria* in general, its Rivers, Lakes, Mountains, Mines, the Nature of the Soil, Fertility, *&c.* with ſeveral judicious Experiments and Remarks on the Altitude of the Earth above the Level of the Sea; but eſpecially on the Qualities of the Air in that Climate; an Abſtract whereof, at firſt drawn up for private Entertainment, was thought not unworthy of more public Notice, and is therefore addreſſed to the *Royal Society*.

The Country, whoſe Natural Hiſtory D. *Gmelin* has collected, is of vaſt Extent: It is bounded by a Chain of Mountains called the *Werchoturian* and *Vralian* on the Weſt; by the Sea of *Kamtſchatka* on the Eaſt; and comprehends all thoſe Countries that lie betwixt the *Mare glaciale*, and the Borders of the *Kalmucks* and *Mongales*, to the very Confines of *China*.

The Rivers which water this Tract are numerous; ſome of them large, and even receiving Streams in their Courſe, which in other Countries would be looked

looked upon as Capitals themſelves. The Space they meaſure is no leſs conſiderable. The *Jaik* is the firſt River of Note on the Weſtern Side. It riſes under the Latitude of 54, of Longitude 78, and runs into the *Caſpian* in 47 of Latitude, and 74 of Longitude. The *Irtiſch* riſes in the Country of the *Kalmucks*, Lat. 46½, Long. 103; and empties itſelf into the *Oby*, Lat. 61, Long. 86. The *Oby* riſes under 52 Lat. 103½ Long.; and loſes itſelf in the *Mare glaciale*, Lat. 67, Long. 86. after running a Courſe of near 800 Leagues, and receiving a great Number of Rivers of conſiderable Note. The *Jeniſea* is not much leſs than the *Oby*. The *Selenga* takes its Riſe under Lat. 48, Long. 114; runs into the Lake *Baical*, in 51° 20″ Latitude, with many others equally conſiderable, which it would be tedious to mention.

The Water of theſe Rivers is for the moſt part freſh, clear, and ſalubrious: In ſome it is a little brackiſh, by the Mixture of Currents from ſalt Lakes and Springs, which abound in many Places: They contain Fiſh of various Kinds in great Plenty, and moſtly of an excellent Flavour.

The Lake *Baical* may deſerve ſome Mention to be made of it, being one of the greateſt freſh-water Lakes yet diſcover'd: It extends, according to our Author, from the one hundred and firſt Degree of Longitude, to the one hundred and twenty-ſeventh, being upwards of 500 Leagues in Length, and is from twenty-five to eighty Leagues in Breadth. It is every-where deep and navigable; the Water is extremely clear; it abounds with great Plenty of fine

fine Fiſh: It receives a great Number of Rivers, but the *Angara* alone runs out of it; which joining the *Tunguſca*, loſes its Name; as this likewiſe does, when it runs into the *Jeniſea*.

Salt Lakes are common in many Parts of *Sibiria*; ſome contain a pure white Salt, well taſted, and fit for Uſe; which, in Summer, is chryſtalliſed by the Heat of the Sun alone, and forms a Cruſt on the Top of the Lake. In ſome, this grows ſo heavy as to break, and fall to the Bottom. Beſides this kind of pure common Salt, which is fit for Uſe, there is another Sort of a bitter Taſte, much reſembling the *Sal mirabile*, found in ſeveral Lakes in this Country. Springs of ſalt Water are ſometimes obſerved to riſe in the midſt of freſh Water: Our Author aſſures us, that he has ſeen ſeveral ſuch; one eſpecially he obſerved riſing thro' a Stone, in the Bed of the River *Angara*.

Before we diſmiſs the ſalt Lakes, we may juſt mention, that on the Banks of the River *Kaptendei*, where it runs into the *Wilvius*, are a great Number of ſalt Springs, which afford excellent Salt; and that, about 30 Leagues above this Place, along the ſame *Kaptendei*, on the right Hand, is a Hill about 30 Fathom high, and 210 long, conſiſting intirely of *Sal Gem*.

There are ſome Lakes, which, our Author informs us, in the Memory of Man, contained only freſh Water, but are now very ſalt. One of this kind, about 40 Years ago, abounded with freſh Water Fiſh, but is now become ſalt, ſmelling ſtrong of Sulphur, with a bitter Taſte, and all the Fiſh are killed.

The Inhabitants aſſured our Author, that ſome freſh-water Lakes have been by degrees dry'd up, and that others have appeared, where formerly it was dry Ground; and that even ſome of theſe new-formed Lakes, which at firſt had no Fiſh in them, are now very plentifully ſtock'd. They have not recourſe to ſubterranean Caverns or Paſſages, for a Solution of this *Phænomenon*; but aſſert, that Ducks, Sea-Mews, *&c.* that live upon Fiſh, carry the Eggs from one Lake to another.

In the Deſcription which our Author gives us of the Courſe of Rivers, Situation of Lakes, *&c.* he takes notice of the Soil, its Barrenneſs, Fertility, *&c.* Theſe are different, as it may be ſuppoſed, in the different Parts of ſuch an extenſive Climate under ſuch Latitudes. About the Lake *Baical* is the moſt fruitful Tract, and thence is called the Granary of that Part of *Sibiria.* They grow ſome little Corn about the Latitude of 61. They have made of late Trials ſtill further; but the Succeſs was not known.

In his Paſſage thro' *Sibiria,* he tells us, that he could ſcarce think himſelf in *Aſia,* till he got over the River *Jeniſea:* Till then, he ſaw no Animals, but ſuch as are common in *Europe,* at leaſt may be ſeen in the Plains waſhed by the lower Part of the *Volga:* The Plants and Stones were of the ſame kind, and the Face of the Country in general, like other Parts of Northern *Europe.* But from the *Jeniſea,* both to the Eaſt, North, and Weſt, the Climate ſeemed to be wholly different, and as if it were enlivened with new Vigour. It is mountainous; but theſe Mountains are intermixed with rich delightful

delightful Valleys, and fruitful Plains. The Animal that affords the Musk, and the *Muſimon* of the Ancients, were now to be met with. Many of the moſt common *European* Plants by degrees diſappeared, and others became frequent, which are Strangers in *Europe*. The Purity, Clearneſs, and Salubrity of the Waters, the exquiſite Taſte of the Fiſh and Fowl, but more eſpecially the different Genius and Way of Life of the Inhabitants, plainly proved they were got into another Climate. This Remark our Author ſubmits to the Conſideration of Geographers.

Amongſt the Curioſities of *Sibiria* the Profeſſor mentions a Place remarkable for its exceſſive Coldneſs in the midſt of Summer. It is in the Province of *Jacutski*, about the middle Way to *Ochotz* along the River *Junacan*; it is called by the *Ruſſians ſpringing Ice*, by the Natives the *icy Lake*. Three other ſuch Places occur within the Circuit of eighty Leagues.

The Provinces beyond the Lake *Baical* are mountainous, with high and wide-extended Plains lying betwixt them, which in many Places are only cover'd with barren Sand; ſo that in ſome Places one may travel thro' ſuch Deſerts one, two, or three Days together, without finding Wood enough to make a Fire, or any other Water than that of ſalt Springs, which are very frequent; and being dried up by the Summer-Heats, leave a ſaline Cruſt, very much reſembling *Natron*, being of an alcaline Nature, with a ſulphureous Smell.

The Country that borders on the Rivers *Uruncan* and *Gaſimur* is extremely rich and fruitful. The

Face of the Country is delightful, and its Produce to the Husbandman almoſt exceeding his Hopes: But what renders it ſtill more ſurpriſing, is, that a Country, whoſe Soil yields to few in Fertility, and the Beauty of its Bloom, ſhould yet cover immenſe Riches in its Boſom. Here are Mines of Gold and Silver, which have long been worked to Advantage: The Veins are rich, and lie ſhallow; yet communicate no poiſonous *Effluvia* to the Vegetables that cover them: Nor do thoſe diſtinguiſhing Marks of Sterility appear here, which in moſt other mining Countries are ſo obſervable.

The higheſt Part of *Sibiria* is towards the Springs of the Rivers *Argun*, *Schilca*, &c. about the 49th Deg. of Lat. 130th Longit. This Part is deſtitute of Marble and Lime-Stone, which are almoſt everywhere to be met with in the lower Tracts both of *Sibiria* and *Ruſſia*: No Petrifications are to be found here, either of the teſtaceous or cruſtaceous Animals: And the Veins of Ore are always found near the Surface, never entering deep into the Earth. Beſides the Mines of Gold and Silver above-mention'd, Copper and Iron are found in ſeveral Places; likewiſe the *Glacies Mariæ* or *Muſcovy Glaſs* is dug near the River *Mama*. Loadſtones are alſo got in *Sibiria*; and in ſeveral of the Rivers beautiful tranſparent Pebbles and Chryſtals occur.

I ſhall only add, that there are ſome natural warm Baths in ſeveral Parts of *Sibiria*, and ſome of them of a moſt agreeable Temperature; and proceed to the Account of our Author's Obſervations and Experiments on the Height of the Earth, *&c.*

Pauda

Pauda is allowed to be the higheſt of all that Ridge of Mountains called *Werkoturian.* Our Author endeavoured to take the Height of it by means of the Barometer.

On the 11th of *December* 1742, at our Author's Lodgings at the Foot of *Pauda*, the Mercury in the Barometer, in a cold Place, but within-doors, ſtood at $26\frac{83}{100}$ *Paris* Meaſure. He then carried it up the Mountain as high as he could go, which was about one Third of the whole Height, where he hung up the Barometer on a Tree, from 9 to 11 in the Forenoon, making a good Fire pretty near it, leſt the intenſe Cold, which ſunk the Quickſilver in *De Liſle*'s Thermometer to 201, ſhould affect the Barometer, and lead him to aſcribe that to Gravity, which was only owing to the Contraction of Cold.

Under theſe Circumſtances the Quickſilver ſunk to $25\frac{32}{100}$.

Hence, according to M. *Caſſini*'s Calculation, our Author' firſt Station will be 941 Feet higher than the Level of the Sea: The ſecond on *Pauda* 1505 f. and the whole Height of this Mountain 4515, or 752 *Paris* Toiſes; which, added to 941 Feet, the Height of his Lodgings at the Foot of *Pauda*, makes 5456 Feet, or 909 Toiſes, the Height of *Pauda*'s Top above the Sea; ſuppoſing the Level of the Sea to be 28 Inches, as the *Paris* Academicians have fixed it: Tho' this differs from Obſervations made on the Barometer at the Sea-coaſt of *Kamſchatka* at *Bolcheretz*; where, from Experiments made for above two Years, the mean Height of the Mercury was 27 Inches, $6\frac{1}{2}$ Lines. And at *Ochotz*, during a Year's Obſervations, the mean

mean Height was found to be 27 Inches and about $8\frac{1}{2}$ Lines.

Hence it would appear, that the Sea of *Kamtſchatka* is higher, with reſpect to the Earth's Centre, than the Ocean and Mediterranean; and at *Bolcheretz* higher than at *Ochotski*.

The following Liſt of barometrical Obſervations, made in various Parts of *Sibiria*, will ſhew the different Heights of the different Tracts in it.

	Feet	Toiſes	Inches
The mean Height of the Barometer, from a Year and 10 Months Obſervations at *Ircuts*, was — —		—	$26\frac{38}{100}$
Its Height above the Sea will then be — —	1355 or 226		—
At *Selengia*, 1 Month's Obſervations, — —		—	$25\frac{95}{100}$
Its Height above the Sea	1779 or 296		—
At *Kiachta*, a Town on the Confines of *China* 12 Days Obſervations in *April* and *May*, mean Height —		—	$25\frac{35}{100}$
Its Height	2400 or 400*		

At

* In the Copy before me appears to be a great Miſtake, either of the Printer, or in the Manuſcript; it being put down in Words at Length, *bis mille quadringentarum Orgyarum cum dimidia*; which is impoſſible; and the Number of Feet is not exact, according to other Calculations.

	Feet	Toiſes	Inches
At *Nertſchia*, from 20 Days Obſervations in *June*,	—	—	$25,\frac{99}{100}$
The Height above the Sea	1738 or 298		—
At the Silver-Mines at *Argun* 9 Days in *July*,	—	—	$25\frac{6}{100}$
The Height above the Sea	2121 or $353\frac{1}{2}$		—

Our Author adds ſeveral judicious Reflections upon the Time and Manner of making theſe Obſervations, in order to determine any thing with Certainty; which he has endeavour'd to keep ſtrictly to in theſe Experiments; and concludes, that the Plains in ſome Parts beyond the Lake *Baical*, are almoſt as high as the Tops of high Mountains in ſome other Countries; Mount *Maſſane*, according to the *French* Geometricians, being but about 408 Toiſes high; which differs but little from the plain Country at *Kiachta*; which yet has conſiderable Mountains riſing in its Neighbourhood.

From whence our Author concludes, that the Elevation of the Earth, in this Tract, above the Level of the Sea, is very great, compared with the Weſt Part of *Sibiria* and *Europe*. *

The

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* M. *De la Condamine*, in his Voyage thro' the inland Part of *South America*, makes *Quito* to be between 14 and 1500 Toiſes above the Level of the Sea. Suppoſe ——— 1450
He tells us, that *Pichincha* is 750 higher — — 750
This makes in the Whole — - - - — 2200 Toiſ. above the Level of the Sea.

P. Martel, Engineer, in his Account of the *Glacieres* in *Savoy*, printed at *London* 1742, tells us, that the Barometer at *Geneva*, by the Side of the *Rhone*, ſtood at $27\frac{2}{12}$ I. which is 656 Feet above the Level of the Sea according to *Scheuzer*; and that the higheſt Point of

The Air of *Sibiria*, with reſpect to its Gravity, is, as in other Countries, the nearer the Sea the heavier; and the more remote, the lighter: So that at *Kiachta* ſcarce one Perſon in our Author's Retinue eſcaped without ſome Indiſpoſition: They were ſeized after their Arrival, ſome with acute Fevers, others complain'd of extreme Laſſitude and Dejection. It was in the Spring Seaſon, the Weather moderate, their Manner of living regular, nor had they been much fatigu'd with their Journey; in ſhort, they could attribute it to no other Cauſe than the Lightneſs of the Air.

In theſe Provinces, *viz.* beyond the Lake *Baical*, our Author tells us, that Intermittents are ſeldom heard of, and Ophthalmies are endemic: But that, in the fenny Tracts which lie near the *Oby* and *Jeniſea*, intermitting Fevers are very frequent.

The Coldneſs of the Air of *Sibiria* is of all others the moſt remarkable Quality. In ſome Places it ſnows frequently in *September*, and not ſeldom in *May*: In *Jacutsk*, if the Corn is not ready to cut in *Auguſt*, which often is the Caſe, the Snow ſometimes prevents it, and buries the Harveſt all together. At *Jacutsk* the Profeſſor order'd a Hole to be dug in the Earth, in a high open Place, on the 18th of *June*; the Mold was 11 Inches deep; below that was Sand about 2½ Feet; it then began to feel hard, and in half a Foot more it was froze as hard as poſſible.

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of *Mont Blanc*, meaſured partly by the Barometer, and where inacceſſible from the Snow that covers it, by trigonometrical Operations, is 12459 Feet, or ſomewhat more than 2076 Toiſes above the Level of the *Rhone*; which, added to the Height of this above the Sea, makes 13115 *French* Feet, or about two *Engliſh* Miles and two Thirds.

poſſible. In a lower Place, at no great Diſtance from this, he order'd another Hole to be dug: The Soil was 10 Inches; ſoft Sand 2 Feet 4 Inches; below this, all was congealed; ſo that the Earth is ſcarcely thaw'd even in Summer above four Feet deep.

Our Author inclines to the received Opinion, that the Eaſtern Climates under the ſame Latitude are colder than the Weſtern; and thinks this is confirm'd by Experiments made in different Parts of *Sibiria*.

The Mercury in *De Liſle*'s Thermometer often ſunk in Winter in very Southern Parts of this Country, as near *Selinga*, to near 226, which is equal to $55\frac{1}{2}$ below 0 in *Fahrenheit*'s Thermometer. But the Cold is often much more intenſe than this, as appears by the following Experiments, made at *Kirenginski*.

Feb. 10. 1738. at 8 in the Morning the Mercury ſtood at 240 Degrees in *De Liſle*; which is 72 below 0. in *Fahrenheit*'s. On the 20th it ſunk one Degree.

At the ſame Place in 1736.

Decemb. 11. at 3 in the Afternoon 254 in *Deliſle*. Almoſt 90 below 0. in *Fahrenheit*.

Decemb. 20. 4 o' Clock *p. m.* 263 in *Deliſle*. $99\frac{44}{100}$ below 0. in *Fahrenheit*.

		D.	*F.*
Novemb. 27.	12 at Noon	270 =	$107\frac{73}{100}$ below 0.
Jan. 9.		275 =	$113\frac{65}{100}$
1735 *Jan.* 5.	5 in the Morn.	260	
	6 —	280 =	120
	8 —	250 and roſe by degrees till 11 at Night, when it ſtood at 252.	

Such an Exceſs of Cold could ſcarcely have been ſuppoſed to exiſt, had not Experiments, made with the greateſt Exactneſs, demonſtrated the Reality of it.

During this extreme Froſt at *Jeniſea*, the Magpies and Sparrows dropp'd down as they flew, and to all Appearance dead; tho' they moſt recover'd when brought into a warm Room. This was quite new to the Inhabitants of that Country; tho' it frequently happens in *Germany* in much leſs intenſe Cold, when the Weather ſets in at once very ſevere.

The Air, ſays our Author, was at that time extremely unpleaſant; it ſeemed as if itſelf was froze, being dark and hazy; and it was ſcarce poſſible even to bear the Cold in the Door-Way for three or four Minutes.

Theſe Experiments, our Author aſſures us, were made with all poſſible Exactneſs, and agree with many others, made in different Parts of *Sibiria* by his Direction; and from theſe we may conclude that the Cold in *Sibiria* is more intenſe than it has yet been found to be in any other Part of the World.

It was not apprehended that a greater Degree of Cold exiſted any-where, than that artificial one produced by *Boerhaave*, by means of concentrated Spirit of Nitre, which ſunk the Mercury 40 Degrees below 0. in *Fahrenheit*'s; which was ſuppoſed to be the Point beyond which no Animal could bear it.

But the utmoſt Limits of Cold are yet unknown; or to what Degree an Animal can ſubſiſt in it, when inured to it by little and little. The Hiſtory of Heat is alike imperfect. The celebrated Profeſſor above-

above-mention'd was induced to think, that a Man could not bear, without the utmoſt Danger, a greater Heat than that which would raiſe the Mercury to 90 in *Fahrenheit's*; but an ingenious and accurate Correſpondent of our Author's at *Aſtrachan* informs him, that it not only riſes there to this Degree frequently, but even to 100, and he has ſeen it 103½. Even in the Bagnio's in *Ruſſia*, the Heat is often equal to 100: It ſometimes makes the Quickſilver aſcend to 108, 10, and to 116, as may be tried every Day; and yet People not only bear them with Impunity a few Minutes, but often ſtay half an Hour or an Hour.

One neceſſary Obſervation our Author makes, which is, that the Ball or Tube containing the Mercury ought to be as dry as poſſible on the Outſide, during theſe or any other Trials with the Thermometer: For the adhering Moiſture, by forming a cooler Atmoſphere around it, has ſometimes occaſion'd a Difference of 10 Degrees.

Theſe are ſome principal Facts given us by our Author in his Preface, relative to the Natural Hiſtory of *Sibiria* in general: What follows chiefly regards the Work it is prefixed to.

As a juſt Idea of this Part cannot be exhibited in a narrow Compaſs, the Curious in this Branch of Science muſt be referr'd to the Book itſelf.

I have only to acknowledge with Gratitude the Inſtruction and Entertainment I have received from this elaborate Work: It is a Tribute juſtly due to the learned and ingenious Author, in Return for the Pains he has taken, and the Fatigue he has endured in this inhoſpitable Region; and to intreat

your Indulgence, if I have flatter'd myſelf too much, in apprehending this Excerpt might afford you ſome Amuſement.

XVIII. Novum reique medicæ utile *Electricitatis* inventum exponit *Joannes Henricus Winkler*, Profeſſor *Lipſienſis*, et *Societatis Regalis Londinenſis Sodalis.*

Lipſiæ, die Martii 12, 1748.

Read March 31. 1748.

SUbtiliter dividendi vim habet Electricitas. Quas vero ſolvit materias, earum partes ſecum abripit, et in loca transfert, in quibus ſcintillæ electricæ exiſtunt. Res odoras in vitreis vaſis bene naviterque concluſas et munitas ita diſcerpit, ut oriundæ exhalationes æque facile, ac vis magnetica, vitrum penetrent, et per atmoſphæram cylindrorum et catenarum, quibuſcum electricitas communicatur, inſtar fluminis dimanent. Quæ ex altera cylindri extremitate egreditur, materia electrica accedentem manum odore aromatico inficit. Non autem perſtat odor communicatus in hac corporis parte, quam electricum flumen afflavit: ſed, continuata adſpiratione, odorifera materia univerſum corpus humanum pervadit. Non modo cutis et veſtimenta fragrant, ſed aer, quem pulmones reddunt, et ſaliva, et ſudor hominis imbuti redolent aromata, quæ in vaſe obturato electricitate agitata ſunt.

Inopinatæ huic virtuti fidem faciunt obſervationes et experimenta, quæ ſenſu animoque attento capta ſunt.